DETERMINATION OF ELECTRICAL CONDUCTIVITY AND PH FROM THE DIFFERENT TYPE HONEY SUCTION PUMP

SITI NUR ATIKAH BINTI MOHD NOOR

B. ENG. TECH.(HONS.) ENERGY AND ENVIRONMENT

UNIVERSITI MALAYSIA PAHANG

SUPERVISOR'S DECLARATION

I hereby declare that I have checked this project and in my opinion, this project is adequate in terms of scope and quality for the award of the degree of Bachelor of Engineering Technology (Energy and Environment) with Honours.

(Supervisor's Signature)

Name of Supervisor : DR. SHAMIL SHAARI

Position : SUPERVISOR

Date : 09/1/2019

STUDENT'S DECLARATION

I hereby declare that the work in this project is my own except for quotations and summaries which have been duly acknowledged. The project has not been accepted for any degree and is not concurrently submitted for award of other degree.

(Student's Signature)

Name : SITI NUR ATIKAH MOHD NOOR

ID Number : TC15014

Date :11 JANUARY 2019

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SITI NUR ATIKAH BINTI MOHD NOOR

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Dedication to My Beloved Family and Friends

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ABSTRACT

In this thesis presents the electrical conductivity and pH values of stingless bee honey samples collected from two different suction circulation; diaphragm vacuum pump and peristaltic pump was investigated. The honey samples were collected from the area of Bukit Goh, Kuantan, Pahang. Physicochemical analyses of parameters such as electrical conductivity and pH values have an important part in defining the overall properties of the honey and acquiring the quality of stingless bee honey in both type of pump. The data from the electrical conductivity shows that the honey samples from the diaphragm vacuum pump and peristaltic pump are 0.48 – 0.95 mS/cm and 0.25- 0.80 mS/cm respectively. Meanwhile, the data from the pH shows that the honey samples from the diaphragm vacuum pump and peristaltic pump are in range of 3.32 – 3.53 and 3.39 – 3.5 respectively. From the research, the value of electrical conductivity of honey sample from diaphragm vacuum pump is slightly higher than peristaltic pump but the pH values of the both pump are same in values. In conclusion, the peristaltic pump can maintain the physicochemical characteristics of stingless bee honey eventhough the both pumps have different in many ways.

ABSTRAK

Thesis ini membentangkan nilai kekonduksian elektrik dan nilai pH daripada madu kelulut yang telah dikumpul menggunakan dua jenis aliran pam yang berbeza iaitu pam diafragma vakum dan pam peristaltik telah diselidik. Sampel madu kelulut ysng dikaji adalah dikumpulkan daripada Bukit Goh, Kuantan, Pahang. Analisis faktor fizikokimia seperti nilai kekonduksian elektrik dan pH sangat penting dalam menentukan sifat madu tersebut secara keseluruhan serta menetukan kualiti madu kelulut dengan menggunakan dua pam yang berbeza. Data menunjukkan bahawa nilai kekonduksian elektrik dari sampel madu yang dikumpulkan melalui pam vakum diafragma dan pam peristaltik adalah 0.48 - 0.95 mS / cm dan 0.25- 0.80 mS / cm. Sementara itu, nilai pH daripada sampel madu dari pam vakum diafragma dan pam peristaltik berada dalam lingkungan 3.32 - 3.53 dan 3.39 - 3.50. Daripada kajian, nilai kekonduksian elektrik sampel madu dari pam vakum diafragma lebih tinggi daripada pam peristaltik tetapi nilai pH bagi kedua- dua jenis pam adalah sama. Kesimpulannya, pam peristaltik dapat mengekalkan ciri-ciri fizikokimia madu kelulut walaupon kedua-dua pam ada banyak perbezaan.

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LIST OF SYMBOLS

g	Gram
ºC	Celsius
µS/cm	Electric conductivity value in micro-Siemens per centimeter
mS/cm	Electric conductivity value in meter-Siemens per centimeter
±	Plus- minus sign
nm	Measurement of wavelength
V	Volume
ml	Millimeter

LIST OF ABBREVIATIONS

sp.	species
T.	*Trigona*
H.	Habenaria
MARDI	Malaysia Agricultural Research and Development Institute
CAC	Codex Alimentarius Commission
PDP	Positive displacement pump
w/v	Weight/volume
EC	Electrical conductivity
pH	Potential of hydrogen
™	Trademark
NaOH	Sodium hydroxide
5-HMF	5-Hydroxymethylfurfural

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter is discussed about the project background, the problem statement of the project, the objectives of the project and project scope.

1.2 PROJECT BACKGROUND

Honey is a natural food, mainly composed of sugars and other constituents such as enzymes, amino acids, organic acids, carotenoids, vitamins, minerals, and aromatic substances. It is rich in flavonoids and phenolic acids that exhibit a wide range of biological effects and act as natural antioxidants (Alqarni et. al., 2012). The composition, colour, aroma and flavour of honey depend mainly on the flowers, geographical regions, climate and honeybee species involved in its production, and are also affected by weather conditions, processing, manipulation, packaging and storage time (Escuredo et. al., 02014; Tornuk et al., 2013). various There are various types of honey in Malaysia such as Acacia, Pineapple, Borneo, Gelam, Kelulut, and Tualang honeys (Chong et. al., 2017). These honeys usually will be classified by the type of bee produced the honey which are, *Apis mellifera* (honey bee) honey and stingless bee honey.

Honey that produced by honeybees (*Apis sp.*) and stingless bees (*Meliponini sp*.) exhibits tremendous medicinal properties such as anti-microbial, anti-carcinogen and antioxidant. Honey is also specially highlighted as a natural remedy in the Holy Quran, as implied in Surah An-Nahl (‘the Bees’) in chapter 16, verse 69. Bees act as plant pollinators for the plants, indirectly resulting in improved plant pollination and increased crop production by up to 40% (Biluca et.al, 2016), thus potentially providing additional

income to beekeepers and their neighbourhoods, while increasing national agriculture products (Mustapa et. al, 2018).

In Malaysia, production of honey by honeybees, such as *Apis melifera*, has not been profoundly successful due to the *Varroa dectructor* mite outbreak of 1996 (Azmi,2016). Thus, availability of local honey is completely dependent on honey hunters who obtain feral honey from stinger honeybees, such as Tualang bees (*Apis dorsata*). The Tualang bees, which mainly nest in the jungle and far off the ground, limit the implementation of standard production procedures. Meanwhile, stingless bees (*Meliponini sp.*) or lebah kelulut which do not have stingers, build nests in already existing cavities or hollowed out areas of trees, buildings and hives. This nesting behaviour provides the opportunity for stingless bees to be cultivated in intensive farms with controlled environmental conditions or in homes in rural areas that implement standard operating procedures. Thus, empowerment of today's stingless bee industry would have direct impact on production of high-quality honey, while also sustaining pollination of crops and other plants, particularly to maintain biodiversity.

In this thesis, the type of bee that would be highlighted is stingless honey bee. Stingless honey bees (also known as stingless bees or meliponines) are a socialize large groups of bees. The tribe Meliponini comprising about 500 species of the stingless bees (Michener, 2007). Although Meliponines have stingers at their back, the stingers are highly reduced and not suitable for defense against the enemy. Usually, stingless bees bite their enemy to protect them from any harm.

In the Southeast Asia, our country; Malaysia is known as one of high biodiversity and one of the indicators for this category is pollinator species according to Malaysian Agricultural Research and Development Institute (MARDI) in 2016. The reports shown that a total of 29 stingless bee species was recorded in Peninsula Malaysia and out of this 17 species were known to inhibit the old-growth forest (virgin forest). The researchers from MARDI believe that there will be more than 50 new species of stingless bees to be discovered in Malaysia (Jaapar & Jajuli, 2016).

Stingless bee breeding had become very commercial in Malaysia since it has been introduced in 2012. The demand for stingless bee honey had been increased from the times to times and the market values for these honey become more precious toward

communities. As stated in Borneo Post newspaper on 31st August 2014, the stingless bee honey was actually contained twice nutritious as honey that produced by normal bees according to the Malaysian Agricultural Research and Development Institute (Mardi).

There are various ways that had been used by the beekeepers to collect the honey from the stingless bees' nest. The most conventional method that recorded that had been used was by using syringes. Unfortunately, this method is very high time- consuming for the user and the volume of honey collected over the time was very low in the quantity. The non-effectiveness of the usage of the syringe to collect the honey leads to the invention of the suction pump honey collector. The suction pump on the present market is using diaphragm vacuum pump.

In this thesis, the type of pumps that suitable for the system will be reviewed and discussed based on its advantages and disadvantages. The peristaltic pump will be using as the final product of the thesis project. The quality of the honey in both suction pump which are vacuum and peristaltic will be compared in pH and electrical conductivity of the honey. This is to make sure the changing in suction would not change the quality of the honey.

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